

## REMARKS

Claims 1-25 are all the claims pending in the application.

### **I. Response to Rejections under 35 U.S.C. § 103(a)**

a. Claims 1-12 and 15-23 were rejected under 35 U.S.C. § 103(a) as obvious over Japanese Patent Document No. 05-295807 to Kunihiro et al. ("JP '807") in view of U.S. Patent No. 4,778,851 to Henton et al.

b. Claims 13, 14, 24 and 25 were rejected under 35 U.S.C. § 103(a) as obvious over JP '807, U.S. Application Publication No. 2007/0122742 to Kato et al. and Henton et al., and further in view of Japanese Patent Document No. 63-179323 to Nobumasa et al. ("JP '323").

Applicants respectfully submit that the claims are patentable over the cited references for at least the following reasons.

Present independent claim 1 relates to a liquid crystal sealing agent composition that is a one-component light and heat-curable resin composition comprising:

(1) a solid epoxy resin having a softening temperature by the ring and ball method of 40°C or above;

(2) an acrylate monomer and/or a methacrylate monomer, or an oligomer thereof;

(3) a thermoplastic polymer having a softening temperature by the ring and ball method of 50 to 120°C, the thermoplastic polymer being obtained by copolymerizing an acrylate monomer and/or a methacrylate monomer with a monomer copolymerizable therewith;

(4) a light-activated radical polymerization initiator; and

(5) a latent epoxy curing agent.

In this composition, the thermoplastic polymer having a softening temperature of 50 to 120°C can compatibilize, i.e., (1) a solid epoxy resin with (2) an acrylate monomer and/or a methacrylate monomer, or oligomer thereof, and further prevents the constituents of the liquid crystal sealing agent composition from exuding and diffusing into the liquid crystal, as described at page 18, lines 3-14, of the present specification.

Further, the presently claimed composition can provide unexpectedly superior results as demonstrated by the examples of the present specification, for example, by a comparison of Example 1, Comparative Example 2 and Comparative Example 3. Specifically, Example 1 is a liquid crystal sealing agent composition, according to the invention defined in present claim 1; Comparative Example 2 is the same composition as Example 1 except for lacking (3) a thermoplastic polymer component; and Comparative Example 3 is the same composition as Example 1 except for using (3) a thermoplastic polymer having a softening temperature of 40°C, which is outside the range of 50 to 120°C recited in present claim 1. As can be seen from the results summarized in Table 2 of the present specification, Example 1 exhibited results superior to Comparative Example 2 in terms of all the test items, i.e., viscosity stability, glass transition temperature of light cured product, gel fraction of heat cured product, cell gap size stability test, bonding strength after light curing, bonding strength after light and heat-curing, display characteristics test of liquid crystal display panel and display characteristics test of shaded area of liquid crystal display panel. In addition, Example 1 exhibited results superior to Comparative Example 3 at least in terms of viscosity stability.

JP '807 discloses a liquid crystal sealing agent that is a one-component light and heat-curable resin comprising:

- (a) a partial acrylized or a partial methacrylized epoxy resin;

- (b) an acrylate or a methacrylate, or an oligomer thereof;
- (c) a solid epoxy resin with a softening point above 40°C;
- (d) a light-activated radical polymerization initiator; and
- (e) a latent epoxy curing agent.

However, JP '807 does not disclose a composition including a thermoplastic polymer having a softening temperature by the ring and ball method of 50 to 120°C, which is obtained by copolymerizing an acrylate monomer and/or a methacrylate monomer with a monomer copolymerizable therewith, as defined in present claim 1.

Henton et al. discloses toughening a wide variety of epoxy resins by adding thermoplastic grafted rubber particles having a core-shell structure. In a preferred embodiment, the grafted rubber particles comprise an acrylate core and an ethyl acrylate/methacrylic acid copolymer shell and maintain a substantially constant morphology during curing conditions.

Neither JP '807 nor Henton et al. discloses or suggests a composition containing a thermoplastic polymer having a softening temperature of 50 to 120 °C, or the unexpected results obtainable in the presently claimed composition.

It was asserted that "[i]t is noted that the curing temperature disclosed by [JP '807] is as low as 100°C ... It would have been obvious to one of ordinary skill in the art at the time of invention to include a thermoplastic component with a softening point above the handling and processing temperatures as taught by Henton et al. in order to improve the roughness of component (c)" (a solid epoxy resin) disclosed by JP '807 (page 3, 2nd paragraph of the Office Action).

Applicants wish to point out that, as mentioned above, in Henton et al., the thermoplastic grafted rubber particles are employed to toughen a wide variety of epoxy resins.

In addition, Kato et al. is relied upon as merely disclosing the softening point for EOCN-1025. Further, JP '323 is relied upon as disclosing a method for preparing a liquid crystal display element without allowing air bubbles to remain in the liquid crystal by dropping a required amount of weighed liquid crystal on the inside of the sealing agent and thereafter curing the sealing agent. Neither Kato et al. nor JP '323 rectifies the deficiencies of JP '807 and Henton et al. Therefore, even if, *arguendo*, there might be motivation to combine JP '323 with JP '807, Kato et al. and Henton et al., the combination still would not result in the presently claimed invention.

In view of the foregoing, Applicants respectfully submit that the present claims are not obvious over the cited references, and thus the rejections should be withdrawn.

## II. Conclusion

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order and such action is earnestly solicited. If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned at (202) 452-7932 at his earliest convenience.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: October 19, 2007

By: \_\_\_\_\_



Fang Liu, Ph.D.  
Registration No. 51283